

Kelli Lynch

*Irradiation Extermination Part 3: A Portable System to Eliminate Waterborne Microorganisms*

Upon learning that 1.4 million people die each year from a lack of clean drinking water, I set about searching for a way to help. The development of an ultraviolet water purifier has taken three years and included four different prototypes. This year, I developed the final prototype, which uses an ultraviolet bulb to purify 4.2 liters of water. Through my testing, I sought answers to: Does Prototype #4 work? What exposure time is needed to purify a solution of *E. coli* and *B. subtilis*? How does dirt impact the necessary exposure time?

I tested the effectiveness of Prototype #4 by using similar concentrations of *E. coli* and *B. subtilis* and exposing the solutions for various times. For the dirt tests, 30g of different sized calibrated dirt were added to the water. Samples were taken from the spigot at the bottom of the device, then diluted and counted after twenty-four hours of incubation.

The results showed that the new prototype is much more effective than the previous designs. Further, the data proves that Prototype #4 can eliminate both gram-negative (*E. coli*) and gram-positive (*B. subtilis*) bacteria. Unfortunately, dirt greatly lengthened the necessary exposure time.

The next step is to add a sand filter to the purifier design. Once filtration is added, Prototype #4 will be able to purify 4.2 liters of water in approximately five minutes using a 30-watt solar panel, and could be powered sustainably in impoverished countries around the world.